

Appl. No. 09/812, 066  
Amdt. Dated May 19, 2004

Attorney Docket No.: ONX-108/CIP  
Reply to Office Action of Nov. 24, 2004

### CLAIM AMENDMENTS

Kindly cancel claims 14, 26 and 29 and amend claims 15, 17, 21, 32, 31, 32 and 48 as shown in the following listing of claims. This listing of claims will replace all prior versions, and listings, of claims in the application.

### LISTING OF CLAIMS

1 Claims 1-14 (cancel)

1 Claim 15. (currently amended) ~~The module of claim 14~~ A beam steering module comprising:  
2 one or more beam steering elements including a first and second deflector array, wherein  
3 the one or more beam steering elements deflect one or more optical signals in two  
4 dimensions,  
5 wherein one or more of the first and second deflector arrays includes an LxM array of  
6 deflectors, where L and M are integers greater than or equal to one  
7 wherein N first and second deflector arrays are stacked to form an NxLxM beam steering  
8 module, where N is an integer greater than or equal to 1,  
9 wherein one or more of the beam steering elements includes a frame, wherein the first and  
10 second deflector arrays are coupled to opposite sides of the frame in a staggered  
11 configuration.

1 Claim 16. (previously presented) The module of claim 15 wherein the frame includes one or more  
2 holes between the two or more arrays on at least one side of the frame.

1 Claim 17. (currently amended) ~~The module of claim 14~~ A beam steering module comprising:  
2 one or more beam steering elements including a first and second deflector array, wherein  
3 the one or more beam steering elements deflect one or more optical signals in two  
4 dimensions,  
5 wherein one or more of the first and second deflector arrays includes an LxM array of  
6 deflectors, where L and M are integers greater than or equal to one  
7 wherein N first and second deflector arrays are stacked to form an NxLxM beam steering

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- 8        module, where N is an integer greater than or equal to 1,  
9        wherein at least one of the first and second deflector arrays is a double-sided array.
- 1    Claim 18. (original) The module of claim 17, wherein the double sided array includes two  
2        substrates back-to-back, wherein each substrate has one or more deflectors on one side.
- 1    Claim 19. (original) The module of claim 18 wherein the back-to-back substrates are separated by  
2        an air gap.
- 1    Claim 20. (original) The module of claim 17, wherein the double sided array includes a single  
2        substrate having one or more deflectors on each side thereof.
- 1    Claim 21. (currently amended) The module of claim [[14]] 17 wherein the first array includes one  
2        or more deflectors configured to rotate about a single first axis.
- 1    Claim 22. (original) The module of claim 21 further comprising relay optics optically coupled to  
2        one or more of the first and second deflector arrays.
- 1    Claim 23. (original) The module of claim 21 wherein the second array includes one or more  
2        deflectors configured to rotate about a single second axis.
- 1    Claim 24. (original) The module of claim 23 wherein the first axis is substantially perpendicular  
2        to the second axis.
- 1    Claim 25. (original) The module of claim 23 wherein the deflectors in the first and second arrays  
2        are optically coupled in a one-to-one correspondence.
- 1    Claim 26. (cancel)
- 1    Claim 27. (original) The module of claim 23 wherein N first and second deflector arrays are  
2        stacked.
- 1    Claim 28. (original) The module of claim 23 further comprising relay optics optically coupled to  
2        one or more of the first and second deflector arrays.

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1 Claim 29. (cancel)

1 Claim 30. (currently amended) The module of claim ~~[[29]]~~ 21 wherein the double-sided array  
2 includes one or more deflectors on one side configured to rotate about a first axis and one  
3 or more deflectors on another side configured to rotate about a second axis.

1 Claim 31. (currently amended) The module of claim ~~[[29,]]~~ 21 wherein N of said double-sided  
2 arrays are stacked, wherein N is an integer greater than 1.

1 Claim 32. (currently amended) ~~The module of claim 14~~ A beam steering module comprising:  
2 one or more beam steering elements including a first and second deflector array, wherein  
3 the one or more beam steering elements deflect one or more optical signals in two  
4 dimensions,  
5 wherein one or more of the first and second deflector arrays includes an LxM array of  
6 deflectors, where L and M are integers greater than or equal to one  
7 wherein N first and second deflector arrays are stacked to form an NxLxM beam steering  
8 module, where N is an integer greater than or equal to 1,  
9 wherein the first deflector array includes one or more dual-axis deflectors configured to  
10 rotate about a first axis and a second axis.

1 Claim 33. (original) The module of claim 32 wherein the second array includes one or more  
2 fixed deflectors.

1 Claim 34. (original) The module of claim 32, wherein the one or more dual-axis deflectors  
2 includes one or more double-sided dual axis deflectors.

1 Claim 35. (original) The module of claim 34, wherein the one or more double-sided dual axis  
2 deflectors includes two substrates back-to-back, wherein each substrate has one or more  
3 deflectors on one side.

1 Claim 36. (original) The module of claim 35 wherein the back-to-back substrates are separated  
2 by an air gap.

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1 Claim 37. (original) The module of claim 34, wherein the one or more double-sided dual-axis  
2 deflectors includes a single substrate having one or more deflectors on each side thereof.

1 Claim 38. (original) The module of claim 32 wherein the second deflector array includes one or  
2 more double-sided fixed deflectors.

1 Claim 39. (original) The module of claim 38, wherein the one or more double-sided fixed  
2 deflectors includes two substrates back-to-back, wherein each substrate has one or more  
3 deflectors on one side.

1 Claim 40. (original) The module of claim 39 wherein the back-to-back substrates are separated  
2 by an air gap.

1 Claim 41. (original) The module of claim 38, wherein the one or more double-sided fixed  
2 deflectors includes a single substrate having one or more deflectors on each side thereof.

1 Claims 42-47 (cancel)

1 Claim 48. (currently amended) An optical switch, comprising:  
2 a first beam steering module;  
3 a second beam steering module optically coupled to the first beam steering module;  
4 wherein at least one of the first and second beam steering modules includes at least  
5 one beam steering element,  
6 wherein the at least one beam steering element deflects an optical signal in two  
7 dimensions,  
8 wherein the at least one beam steering element includes a stack containing one or  
9 more first deflector arrays optically coupled to one or more second deflector arrays  
10 wherein one or more of the first and second deflector arrays includes a double sided  
11 array,  
12 wherein the double sided array has on one side one or more deflectors configured to  
13 rotate about a single first axis, the double sided array having on another side one more  
14 deflectors configured to rotate about a single second axis; or

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15 wherein the double sided array has on one side one or more deflectors configured to  
16 rotate about a first axis and a second axis, the double sided array having on another  
17 side one more fixed deflectors[[: or]]  
18 wherein.

1 Claim 49. (original) The switch of claim 48 further comprising relay optics optically coupled to  
2 one or more of the first and second beam steering elements.

1 Claim 50. (original) The switch of claim 49, further comprising relay optics coupled to one or  
2 more of the first and second modules.

1 Claim 51. (original) The switch of claim 49 wherein the first and second beam steering modules  
2 are part of a plurality of first and second beam steering modules disposed along a curved  
3 surface.

4 Claim 52. (original) The switch of claim 51 further comprising a fold deflector optically coupled  
5 between the first and second beam steering modules.

1 Claim 53. (original) The switch of claim 52 wherein the fold deflector is partially transparent.

1 Claim 54. (original) The fold deflector of claim 53, further comprising a photodetector array  
2 optically coupled to the partially transparent fold deflector.

1 Claim 55. (cancel)

1 Claim 56. (previously presented) The switch of claim 48 wherein the first and second beam  
2 steering modules are part of a plurality of first and second beam steering modules  
3 disposed along a curved surface.

1 Claim 57. (original) The switch of claim 56 further comprising a fold deflector optically coupled  
2 between the first and second beam steering modules.

1 Claim 58. (cancel)

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- 1 Claim 59. (previously presented) The switch of claim 48 wherein the first and second beam  
2 steering modules are part of a plurality of first and second beam steering modules  
3 disposed along a curved surface.
- 1 Claim 60. (original) The switch of claim 59 further comprising a fold deflector optically coupled  
2 between the first and second beam steering modules.
- 1 Claim 61. (previously presented) The switch of claim 48, further comprising a fold deflector  
2 optically coupled between the first and second beam steering modules.
- 1 Claim 62. (original) The switch of claim 61, wherein the fold deflector is a curved fold mirror.
- 1 Claim 63. (original) The switch of claim 62, wherein the first and second modules are arranged  
2 in a substantially planar configuration.
- 1 Claim 64. (original) The switch of claim 62, wherein the first and second modules are arranged  
2 in a substantially curved configuration.
- 1 Claim 65. (previously presented) The switch of claim 48 wherein the first and second modules  
2 are arranged in a substantially planar configuration.
- 1 Claim 66. (previously presented) An optical switch, comprising:  
2 a first beam steering module;  
3 a second beam steering module optically coupled to the first beam steering module;  
4 wherein at least one of the first and second beam steering modules includes at least one  
5 beam steering element,  
6 wherein the at least one beam steering element deflects an optical signal in two  
7 dimensions,  
8 wherein the first and second modules are arranged in a substantially curved  
9 configuration.
- 1 Claims 67-69. (cancel)

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- 1 Claim 70. (previously presented) An optical switch comprising:  
2 at least one beam steering module having at least one beam steering element, wherein the  
3 at least one beam steering element deflects an optical signal in two dimensions,  
4 wherein the at least one beam steering module is removable from the switch.
- 1 Claim 71. (previously presented) The optical switch of claim 70 further comprising a power tap  
2 optically coupled to the beam steering element, the switch further comprising a controller  
3 coupled to beam steering element and the power tap in a feedback loop.
- 4 Claim 72. (original) The switch of claim 71 further comprising a calibration light source coupled  
5 to the beam steering element and power tap.
- 6 Claim 73. (previously presented) The switch of claim 72 wherein the calibration light source  
7 provides a fixed frequency light that doesn't conflict with a signal frequency.
- 1 Claim 74. (previously presented) The switch of claim 70 wherein the optical signals enter and  
2 leave the switch along substantially parallel paths.
- 1 Claim 75. (previously presented) The switch of claim 70 further comprising one or more  
2 collimators optically coupled to the beam steering element.
- 1 Claims 76-77. (cancel)
- 1 Claim 78. (previously presented) The switch of claim 70 wherein the at least one beam steering  
2 element includes a first deflector array optically coupled to a second deflector array.
- 1 Claim 79. (original) The switch of claim 78, wherein one or more of the first and second  
2 deflector arrays includes an  $L \times M$  array of deflectors, where  $L$  and  $M$  are integers greater  
3 than or equal to one.
- 1 Claim 80. (original) The switch of claim 79, wherein  $N$  of said  $L \times M$  arrays are stacked to form  
2 an  $N \times L \times M$  beam steering element.

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1 Claim 93. (original) The switch of claim 92, wherein the second array includes one or more fixed  
2 deflectors.

1 Claim 94. (original) The switch of claim 93 wherein the one or more fixed deflectors is a single  
2 continuous fixed deflector.

1 Claim 95. (original) The switch of claim 92, wherein the one or more dual-axis deflectors  
2 includes one or more double-sided dual axis deflectors.

1 Claim 96. (original) The switch of claim 95, wherein the second array includes a single  
2 continuous fixed deflector.

1 Claim 97. (original) The switch of claim 95 wherein the one or more dual-axis deflectors  
2 includes a double-sided dual-axis deflector optically coupled to a double-sided fixed  
3 deflector in a sandwich.

1 Claim 98. (original) The switch of claim 97 wherein a plurality of said sandwiches are stacked.

1 Claim 99. (original) The switch of claim 92, wherein one or more of the first and second arrays  
2 includes a double-sided array having one or more dual-axis deflectors on one side and  
3 one or more fixed deflectors on the other side.

1 Claim 100. (original) The switch of claim. 99, wherein a plurality of said double-sided arrays are  
2 stacked.

1 Claims 101-117. (cancel)

1 Claim 118 (previously presented) The switch of claim 66, further comprising a fold deflector  
2 coupled to the at least one beam steering module.

1 Claim 119 (previously presented) The switch of claim 70, further comprising a fold deflector  
2 coupled to the at least one beam steering module.